

1984

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Citation of this paper:

Blomqvist, Åke, Sharif Mohammad. "Controls, Corruption, and Competitive Rent-Seeking in LDC's." Centre for the Study of International Economic Relations Working Papers, 8418C. London, ON: Department of Economics, University of Western Ontario (1984).

ISSN 0228-4235
ISBN 0-7714-0537-5

CENTRE FOR THE STUDY OF INTERNATIONAL ECONOMIC RELATIONS

WORKING PAPER NO. 8418C

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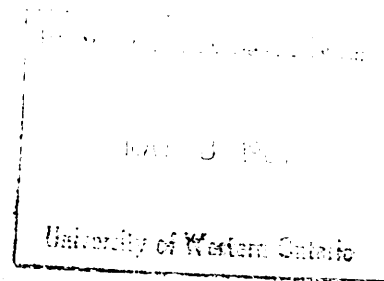
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CONTROLS, CORRUPTION, AND COMPETITIVE RENT-SEEKING IN LDCs

by

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ABSTRACT

The paper establishes that equality between the average return of factors engaged in rent-seeking and those in productive activity does not generally imply equality between the efficiency losses from rent-seeking and the rents themselves; such equality is often assumed in the literature. A stylized CGE-model is used to illustrate the sensitivity of the estimated losses to the specification of the rent-seeking mechanism. It also illustrates the interdependence between the effects of taxes or subsidies and rent-seeking. For example, when rent-seeking involves post-secondary graduates competing for government jobs which yield incomes from corruption, the efficiency losses are affected by subsidies to education.

April, 1984

I. Introduction

In many poor countries, extensive networks of quantitative controls have emerged, as a by-product of governmental attempts to influence the pace of development through centralized planning. An important branch of the recent literature on microeconomic problems in LDCs has been concerned with investigating the nature and extent of the resource waste that is often thought to result from such controls.

The idea that quantitative controls cause efficiency losses is not new, of course. However, in older literature these losses were usually considered to be no more extensive than those that would have resulted from an equivalent set of taxes.¹ A central hypothesis in the recent literature is that the allocative losses may be much more extensive under a control regime because of the likelihood that such a regime may give rise to various forms of rent-seeking. If the goods subject to quantitative controls are allocated by means of a licensing system which allows those with a license to buy a certain amount of the good at a price below the market-clearing one, the licenses will generate rents if the goods can be resold at the higher market-clearing price. If there are ways in which agents can influence the probability that they will be granted a license, they may find it profitable to devote resources to activities that increase this probability, rather than to activities that create socially useful goods and services. (Bhagwati has used the phrase "directly unproductive profit-seeking activities", or DUPs, to describe various forms of rent-seeking; the phrase serves to emphasize the waste they imply.)

¹Equivalent in the sense that they would have led to the same set of equilibrium quantities that resulted under the control regime.

According to some estimates, the losses from rent-seeking may be very significant. In an early article, Anne Krueger (1974) suggested that they might have been as large as 7.3 percent and 15 percent of national income in India and Turkey, respectively, in the 1960s. Recent work by Mohammad and Whalley (1983) indicates even larger losses in the Indian cases: their estimates run as high as 30-45 percent of Indian GNP.

Like Krueger, Mohammad and Whalley approximate the magnitude of the efficiency losses from rent-seeking by the value of the rents themselves. Krueger's justification for the validity of this approximation is ingenious. She first assumes that in equilibrium the average return (including rents) of a factor wholly or partially engaged in rent-seeking, must be equal to the return that this factor could earn in alternative employment. (In her model, this is equivalent to the condition that the average wage rate of all the labour engaged in rent-seeking and distribution of imported goods has to be equal to the competitive wage rate in agriculture.) She then shows that in her model, this equilibrium condition implies that the opportunity cost of the rent-seeking activity is equal to the value of the rents themselves.

The plausibility of Krueger's equilibrium condition, as well as the elegance and simplicity of her analysis, probably explain why her method has been so widely used in subsequent analysis of the welfare losses from rent-seeking. However, while her equilibrium condition appears plausible no matter what the exact specification of the rent-seeking process, the relationship between the welfare losses and the value of the rents can be shown to be highly sensitive to the precise way Krueger's model is

specified. In particular, it turns out to depend critically on her assumption of a fixed-coefficient relationship between the amount of imports into a country and the amount of labour resources required for distribution of these imports.

The preceding discussion suggests that the precise "rules of the rent-seeking game" may be a very important determinant of the magnitude of the efficiency losses from rent-seeking. In particular, it suggests that the analysis of rent-seeking should pay more attention to the role of straightforward corruption in the allocation of rent-yielding assets. The conventional argument has been that corruption only changes the locus, but not the extent, of unproductive rent-seeking behavior: if the rents from import licenses, say, are collected by corrupt government officials, there will just be competitive rent-seeking among individuals trying to obtain positions as government officials rather than among individuals trying to obtain import licenses. However, if the mechanism involved in allocating government jobs is different from the mechanism used in Krueger's model for the allocation of import licenses, the equivalence between the value of the rents and the value of the efficiency losses will break down.

The main purpose of this paper is to provide a set of numerical illustrations of these points, by evaluating rent-seeking losses in the framework of a simple computable general equilibrium model, under varying assumptions concerning the way the rent-yielding licenses are allocated. Another purpose of the paper is to illustrate the point that if there are other distortions in the economy, these distortions may affect the magnitude of the efficiency losses. Under certain circumstances, it is even possible that a situation may arise in which rent-seeking may, paradoxically, be

welfare improving.¹ Furthermore, our results also illustrate the important point that the efficiency effects of various tax and subsidy distortions may depend heavily on the type of rent-seeking that takes place in the economy.

The rest of the paper is organized as follows. In the next section we specify our basic model in general terms, and diagrammatically illustrate the nature of the efficiency loss under various assumptions. In the third section, we report the results of some numerical experiments in which we use a small and highly stylized general equilibrium model of the Indian economy to derive hypothetical estimates of the losses from rent-seeking under two alternative forms of competition for rents. Section IV, finally, contains conclusions and suggestions for further research.

II. Specifying a Model of Rent Seeking

i) The basic model

We consider a very simple model of an economy in which two goods are produced, a manufactured good M and a primary good P. The factors of production used to produce the manufactured good are capital, unskilled labour and skilled labour, while the primary good is produced using unskilled labour and land. It is assumed that the production technology for each good can be described by a neo-classical constant-returns-to-scale production function:

$$(1) \quad M = m(C_m, L_m, S_m)$$

$$(2) \quad P = p(L_p, \bar{H})$$

where M and P are the quantities of the manufactured and primary goods, respectively, C_i , S_i and L_i denote the amounts of capital services and services of skilled and unskilled labour, respectively, in the i^{th} sector, and \bar{H} denotes the (exogenously given) amount of land used in production of the primary good.

¹ Such a situation has been analyzed by Bhagwati and Srinivasan (1980) who showed that if the revenue from an import tariff were subject to "revenue seeking", the distortion implied by the tariff might under certain circumstances render this activity welfare improving, even though it would involve throwing resources away.

In the short run, the services of capital and skilled labour depend on the existing stocks of capital and trained manpower. In the long run, however, these stocks can increase or decrease because of investment and depreciation. We will implicitly take an extreme long-run view in this paper, by neglecting the stock-flow distinction and simply treat the services of capital and skilled labour as currently produced intermediate inputs.¹ The production of both kinds of services is assumed to require inputs of capital, skilled, and unskilled labour. For simplicity, we assume that the respective production technologies can be described by fixed-coefficient production functions:

$$(3) \quad C = \min\left(\frac{C}{a_{cc}}, \frac{S}{a_{cs}}, \frac{L}{a_{cl}}\right)$$

$$(4) \quad S = \min\left(\frac{C}{a_{sc}}, \frac{S}{a_{ss}}, \frac{L}{a_{sl}}\right),$$

where

$$(5) \quad C = C_c + C_s + C_m$$

is the total amount of capital services and

$$(6) \quad S = S_c + S_s + S_m$$

the total amount of skilled labour services, and the a_{ij} 's represent the quantities of the j^{th} input per unit of output in the i^{th} sector. We also have

$$(7) \quad L_m + L_p + L_c + L_s = \bar{L}$$

where \bar{L} is the exogenously given total amount of unskilled labour in the economy.

¹Because we use this convention, the comparative statics experiments we discuss later must be interpreted as comparisons between long-run steady states of the system. For an example of the use of this convention in another context, see the model of education and the "brain drain" in Bhagwati and Hamada (1974).

Both manufactured goods and primary goods can be traded internationally; the relative price of manufactured and primary goods in the world market is equal to unity. Imports of the manufactured good, however, are supposed to be limited by an import quota, with the maximum amount of total imports denoted by \bar{Q} . The primary good is used as the numeraire for domestic prices; that is, its domestic price is unity as well. When the import quota is binding, however, the domestic relative price of the manufactured good need not be equal to the international relative price,¹ but will be endogenously determined in the domestic market. We denote this relative price by π .

Turning to the demand side, we assume that there is a single consumer in the economy. The consumer maximizes a utility function given by

$$(8) \quad U = U(Q_m, Q_p)$$

subject to his budget constraint given by:

$$(9) \quad Q_p + \pi Q_m \leq Y.$$

Here Q_i denotes domestic consumption of the i^{th} good. Consumer income Y includes the total revenue from the production of M and P ; in addition, it also includes the rent R that accrues to those agents who are able to buy imported goods at the international (tariff-inclusive) price and resell them at the higher domestic price π , as well as any revenue T collected by the government from an import tariff on the manufactured good. Under competitive conditions, the value of the rents plus the import duties will equal the difference between the value of the imported manufactured goods at domestic and international prices:

$$(10) \quad \bar{Q}(\pi - 1) = R + T.$$

Thus, total income including rents and tariff revenue can be written:

$$(11) \quad Y = P + \pi M + (\pi - 1)\bar{Q}.$$

¹More precisely, it need not be equal to the international relative price plus any tariff imposed on imports of the manufactured good.

After solving the consumer's maximization problem defined by (8) and (9), one can construct a demand function for the manufactured good:

$$(12) \quad Q_m = D(\pi, Y).$$

The model is closed by imposing the condition that demand for the manufactured good equals the supply from both imports and domestic production:¹

$$(13) \quad D(\pi, Y) - \bar{Q} - M = 0.$$

We will not formally discuss conditions for the existence and uniqueness of equilibrium solutions for various versions of the model, but simply assume that unique equilibria exist. A computational procedure for finding the solutions is outlined in the Appendix.

The version of the model that has just been described does not incorporate rent-seeking. One can think of this version as corresponding to a system in which the fixed amount of imports is allocated through a licensing system with the licenses being auctioned by the government and the revenues from the auction being distributed through the economy in a lump-sum fashion. We now turn to a discussion of various ways in which our specification could be modified to incorporate rent-seeking.

ii) Rent-seeking: The conventional approach

In the work of Krueger (1974), Bhagwati and Srinivasan (1980), and Mohammad and Whalley (1983), the exact form of the rent-seeking activity is not specified. It is assumed that there are various ways in which individuals can use real resources to influence the probability that they will be allocated an import license. It is then suggested that if rent-seeking is competitive in the sense that any agent in the economy is free to enter the rent-seeking activity, in equilibrium the total value of the resources employed in rent-seeking will approximate the total value of the rents being sought. One way to rationalize this suggestion is to specify a constant-returns-to-scale

¹When supply equals demand for the manufactured good, the domestic market for the primary good is also in equilibrium by Walras' law. It is also easy to show that when consumers obey their budget constraint, the balance of trade is in equilibrium: when $Q_m = \bar{Q} + M$, (9) and (11) imply $\bar{Q} = P - Q_p$.

function which gives the amount of rent-seeking activity as a function of the amount of real resources withdrawn from socially useful production and devoted to this unproductive activity; it is then assumed that an agent's share of the fixed total of import licenses is equal to his share in the total rent-seeking activity. This is the approach implicitly taken by Bhagwati and Srinivasan, and the analysis of Krueger is also consistent with this specification.¹

It is possible to think of some real-life situations in which the system for allocating rent-bearing assets created by government controls is approximated by this kind of process. (Allocation by simple queuing might be an example.) However, casual empiricism suggests that there are other types of allocation mechanisms which are at least as common in LDCs. As an obvious example, many kinds of licenses are simply allocated by corrupt officials to the highest bidder. Such a system is equivalent to auctioning the licenses, except that the revenue is collected by the corrupt officials rather than taxpayers at large. In other cases, licenses may be allocated to firms which produce certain kinds of goods, or which have large amounts of installed capacity (Bhagwati and Desai (1970)). While these kinds of allocation mechanisms may give rise to some real losses from rent-seeking, there is no direct resource waste such as that implied in the models discussed previously. Or finally, consider the case where the rents accrue to corrupt officials, but where individuals can compete for the rents indirectly associated with government jobs, by bribing the politicians who appoint the officials. In this case, the rents will be passed on from government officials to the politicians. But if candidates for political office compete with each

¹ Krueger specified that the labour engaged in rent-seeking was technically employed in the distributive sector. However, her assumption that the technology in that sector was characterized by a fixed coefficient relationship between the amount of imports and the amount of labour required in distribution, together with the assumption that the amount of imports to be distributed was fixed, implied that the additional labour entering the sector in search of rents, did in fact have zero social marginal productivity.

other by bribing voters (in cash or in kind), the rents will ultimately end up with the voters. It is not obvious what efficiency losses (if any) are implied by this type of rent-seeking. In any case, it seems to us that one ought to recognize that there exists a wide range of plausible specifications of the system used to allocate rent-bearing licenses, and since we will illustrate that the estimated efficiency losses may be highly sensitive to the choice of specification, we conclude that there is an urgent need for more empirical research on the question of how the license allocation systems actually work in various LDCs: unless we have better empirical support for the way we specify this allocation system, we cannot be sure that any given estimate of the rent-seeking loss represents even a reasonable approximation of the true efficiency loss.

In our formal model, we consider several versions of a fairly special kind of rent-seeking. The basic assumption is that the rents arising from the quantitative control over imports accrue to corrupt government officials who sell import licenses to the highest bidder. We assume that the number of positions as a government official is fixed, and that each position is filled by an educated person.¹ Because of the rents collected by the government officials, educated people in the economy will compete for government jobs. We will consider several hypothetical methods for allocating these rent-bearing jobs and the efficiency loss associated with each method. In the first case we consider, we specify an allocation method analogous to that employed by Krueger and Bhagwati-Srinivasan. We assume that in order to have a chance of obtaining a government job, educated individuals have to devote themselves full-time to competing for such a job; the probability that a job-seeker will get a government job is the same for each individual in the pool of job-seekers.

¹For simplicity, we assume that government officials are not paid salaries.

Employing the same reasoning as earlier authors, we postulate that the number of job-seekers will increase until the average return to job-seeking (or rent-seeking) is the same as its opportunity cost which, in turn, is equal to the wage rate of educated labour in the non-government sector. Thus, if we denote the number of units of educated labour engaged in rent-seeking by S_R , we have the equilibrium condition:

$$(14) \quad w_s = \frac{R}{S_R}$$

where w_s is the return to educated labour in the private sector.

When $S_R > 0$, equation (6) has to be modified and will now read:

$$(6') \quad S = S_c + S_s + S_m + S_R.$$

If w_s can be identified as the social opportunity cost of a unit of skilled labour, (14) immediately implies that the efficiency loss from rent-seeking can be approximated¹ by $w_s S_R$, which is equal to the value of the rents themselves. Thus, this specification yields the conventional estimate of the efficiency loss.² In the initial variant of this basic specification, we assume that education is a subsidized activity. In this case, the efficiency loss may be larger than the value of the rent, because the social opportunity cost of each unit of rent-seeking educated labour is then higher than w_s . Figure 1 illustrates the efficiency loss in a partial-equilibrium diagram of the market for educated labour.

¹The result is an approximation only, because the opportunity cost of inframarginal units of skilled labour will be slightly different from w_s . Krueger (1974) recognizes that her estimates of the efficiency losses from rent-seeking are approximations in this sense.

²Note that (14) is entirely analogous to the conventional definition of equilibrium in the urban labour market in the Harris-Todaro model of rural-urban labour allocation with a rigid urban wage. The Harris-Todaro equilibrium condition is that the total urban wage bill divided by the urban labour force (consisting of both the employed and the unemployed) be equal to the opportunity cost of leaving the rural area. In this model, (14) can be expressed as saying that in equilibrium, the total rent divided by the number of rent-seekers (both those currently enjoying rents and those in the pool of rent-seekers) equals the opportunity cost of leaving private sector employment.

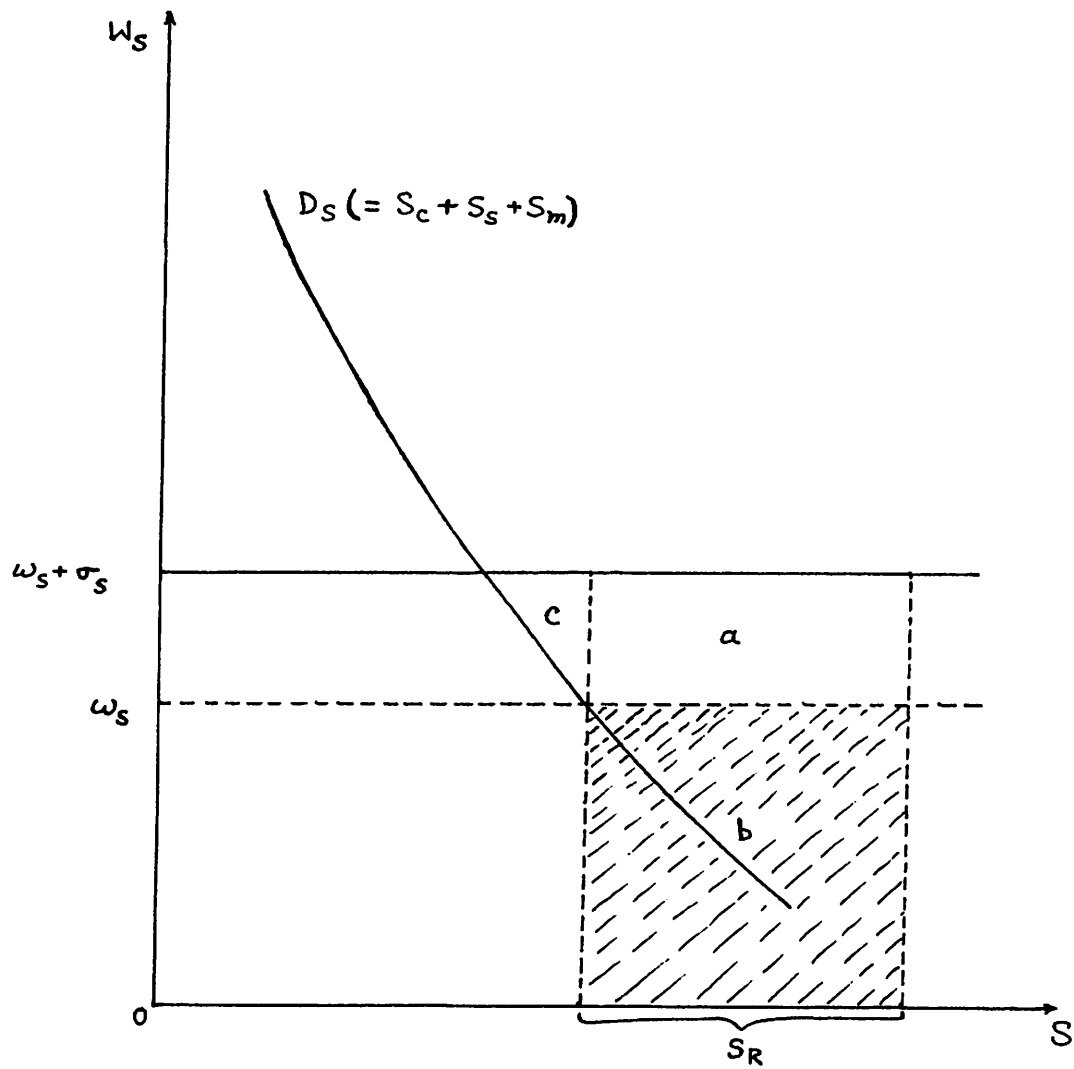


Figure 1

Note:

σ_s is the per unit direct subsidy to education.

Total welfare loss is area $(a + b + c)$; total rent is area (b) .

The cost of producing one unit of educated labour services is given by $(w_s + \sigma_s)$.

iii) An alternative specification

While the specification described above of the mechanism for allocating government jobs is consistent with what has become the conventional approach, in our view it is not particularly realistic. It is no doubt true that many people who acquire higher education in a country such as India, for example, do so in the hope of obtaining a job in the Civil Service. However, most of the individuals actually hired as government officials are drawn from among those whose academic performance has been superior, and they are typically hired within a relatively short period after graduation. Both of these factors imply that the group of educated people who, at any given time, are devoting their full time to competing for government jobs (i.e., rent-seeking) is relatively small. For simplicity, we will assume in this section that government jobs are allocated strictly on the basis of academic performance. This implies that there will be no rent-seeking by individuals who have completed their education (that is, $S_R = 0$). However, if an individual's academic performance cannot be predicted before he or she enters school, many individuals will take into account the expected income from obtaining a government job and earning rents from corruption, as well as the wage of educated workers in private employment, before deciding whether to enter school. If education is supplied by competitive firms, if all individuals have the same probability ex ante of landing a government job, and if all individuals are risk-neutral, then individuals will enter the educational system until the following equality holds:

$$(15) \quad a_{sc} w_c + a_{ss} w_s + a_{sl} w_l = w_s + \sigma_s + \sigma_R$$

where w_c and w_l are the returns to capital services and unskilled labour, respectively, σ_s is the direct subsidy to education, and where

$$(16) \quad \sigma_R = \frac{R}{S}.$$

Equation (15) can be interpreted as follows. The left-hand side represents the unit cost of the services of educated labour, or equivalently, the supply price of these services. In equilibrium, this must be equal to the expected return to educated labour, which consists of the wage rate of educated labour in the private sector, plus the terms $\sigma_s + \sigma_R$, where the latter is the expected value ex ante of the rents that an educated individual will collect as a corrupt government official.

The efficiency loss from this form of indirect rent-seeking is quite different from that under the mechanism specified in the previous subsection. There is no direct resource waste. However, as is clear from (15), the expected rents per educated worker, σ_R , will have the same effect on the economy as a subsidy to education. Thus there will be an efficiency loss from this kind of rent-seeking which is equivalent to the loss that would result from direct subsidy to education equal to σ_R . Figure 2 gives a partial-equilibrium illustration of the efficiency loss in this case; note that the efficiency loss from the implicit subsidy σ_R is in addition to the loss that may exist due to any explicit subsidy (measured by e in the diagram).

III. Quantitative Illustrations

In this section, we employ a computable general equilibrium (CGE) version of the model outlined in the previous section to provide quantitative estimates of the extent of welfare losses from rent-seeking under various hypothetical conditions. While the model is too simplified to be considered a representation of any actual economy, the data underlying our numerical specification were based on statistics from the economy of India in 1979/80; the methodology used to fit the model to these data is briefly described in the Appendix. Our estimates can therefore at least be regarded as giving the order of magnitude of

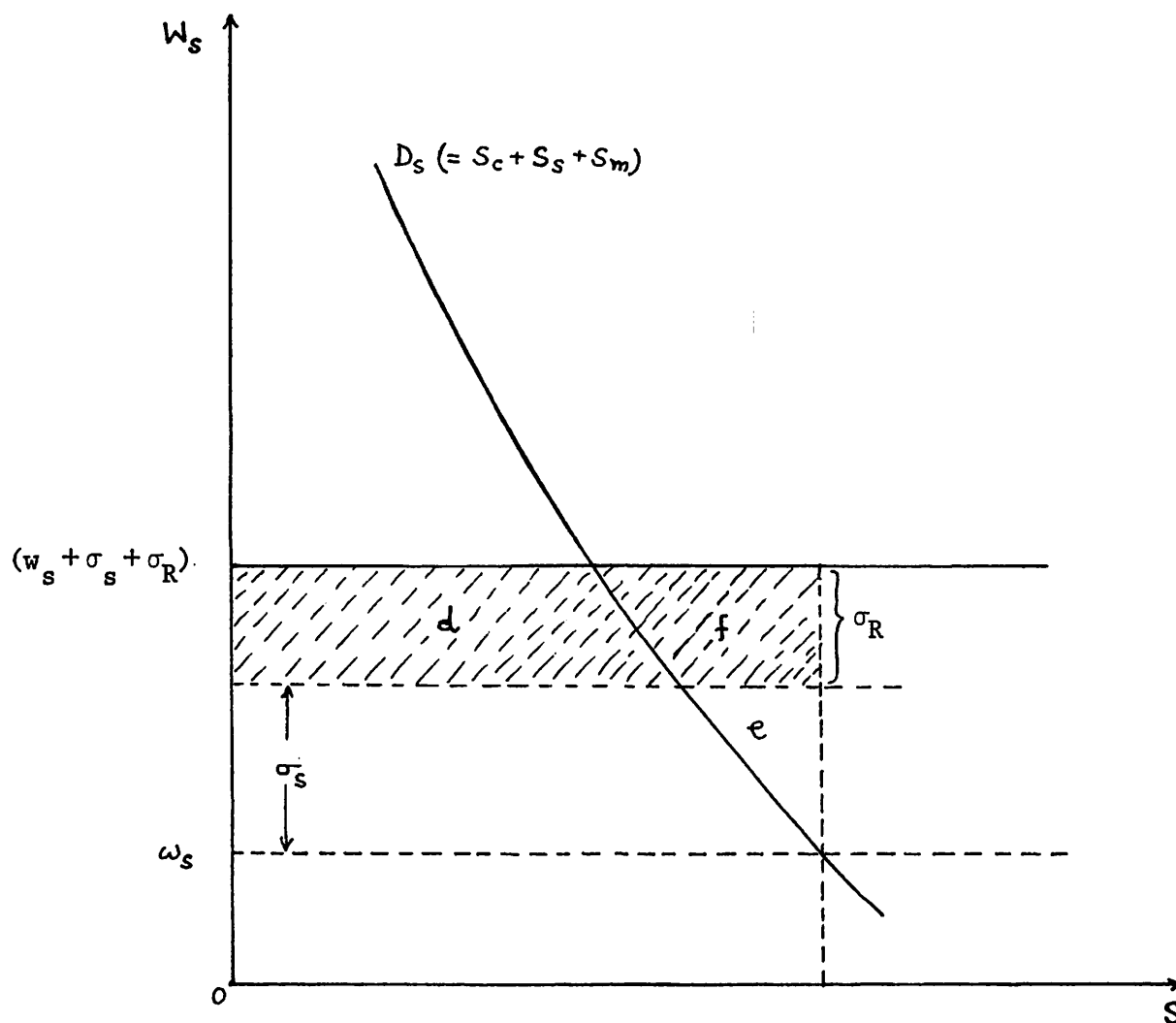


Figure 2

Note:

Total welfare loss is area $(e + f)$.

Total rents equal area $(d + f)$.

In this diagram the social cost of one unit of educated labour services is given by $(w_s + \sigma_s + \sigma_R)$.

the welfare losses that would result from various hypothetical forms of rent-seeking in India.

Our simulation experiments were divided into two sets. In the first set, we used the conventional type of assumption concerning the form of rent-seeking, corresponding to the equilibrium condition (14). The second set illustrates the effect of rent-seeking under the alternative more plausible specification under which rent-seeking does not involve any direct resource waste, but implies an incentive for individuals to become educated as a means of participating in the "lottery" through which government jobs are allocated; this is the specification corresponding to the equilibrium condition (16) rather than (14). For each of these two main cases, we estimated the losses from rent-seeking under various hypothetical assumptions concerning other kinds of tax or subsidy distortions in the economy. In each simulation, the losses from rent-seeking were measured using the concept of the equivalent variation EV ;¹ that is, the efficiency loss from having rent-seeking is measured as the efficiency gain forgone by not eliminating rent-seeking.

The results from the first set of simulations are summarized in Table 1. For each of the four sub-cases (1)-(4), we show the quantities of manufactured and primary goods produced with and without rent-seeking. In the solutions

¹The equivalent variation can be defined as follows. Let u' be the level of utility attained by the economy's single consumer in the absence of rent-seeking, and let π^0 be the relative price of the manufactured good in the initial situation with rent-seeking; finally, let $Y(u, \pi)$ be the expenditure function which defines the minimum income necessary to reach utility level u at the relative price π . Then we have

$$EV = Y(u', \pi^0) - Y^0,$$

where Y^0 is the actual level of income in the initial situation with rent-seeking.

without rent-seeking, denoted by b, the entry in the EV-column measures the efficiency gain of eliminating rent-seeking starting from the corresponding solution with rent-seeking (denoted by a). The entries in the EV-column for solutions 2a-4a, on the other hand, measure the efficiency gain (or loss) associated with changing taxes or subsidies so as to move the economy from the "base solution" (solution 1a) to either of the new solutions 2a-4a, without eliminating rent-seeking.

The solution values for case 1a correspond to the estimated actual values for the Indian economy in 1979 80, as briefly described in the Appendix. As shown in the table, the total value of rents was set at some 88 billion rupees, or about 12 percent of estimated GNP. This number was arrived at by assuming that the total value, in the domestic market, of imported goods, was twice as high as their "landed value"; that is, their value at international prices times one plus the average ad valorem tariff rate (the latter was estimated at 44 percent). This results in an assumed domestic relative price of the importable good of $(1.44 \times 2) = 2.88$ and total rents of $61 \text{ billion} \times (2.88 - 1.44) = 88 \text{ billion}$, as shown. We further assumed that the use of capital was heavily subsidized; the subsidy rate σ_c was set at 1.44, which corresponded to a 50% subsidy rate in the initial solution. The subsidy rate σ_s for the cost of education was set at 4.04, corresponding to an estimated 50% subsidy on the cost of education in the initial solution.¹

Consider now solution 1b, with the same subsidy parameters as in 1a but with no rent-seeking. The losses from rent-seeking are estimated at

¹ Because the cost of the services of educated labour includes the cost of one unskilled worker as well as the flow cost of education, the subsidy was much lower when expressed as a percentage of the cost of these services.

Table 1

Results of Simulation Experiments, Version 1[†]

Case	Rent*	EV**	M	P	π
1a	88	n.a.	87	356	2.88
1b		71 (9.8%)	103	383	2.72
2a	106	19	90	366	3.18
2b		73 (9.2%)	105	393	3.03
3a	191	-7	82	366	4.57
3b		189 (19.7%)	111	424	4.31
4a	177	-39	76	351	4.34
4b		221 (25%)	111	421	4.02

NOTES:

[†]Rent-seeking in this version is assumed to take the form corresponding to equilibrium condition (14): $S_R = R/w_s = (\pi - 1.44)\bar{Q}/w_s$. For all subcases, simulation a denotes solution with rentseeking, simulation b without rentseeking.

Parameter settings:

Case 1: $\sigma_c = 1.44$, $\sigma_s = 4.04$ 2: $\sigma_c = 1.44$, $\sigma_s = 0$ 3: $\sigma_c = 0$, $\sigma_s = 0$ 4: $\sigma_c = 0$, $\sigma_s = 4.04$.

* Billions of rupees.

** Billions of rupees; figures in parentheses are percent of GNP. For cases 2a, 3a, 4a, EV denotes the equivalent variation of changing the subsidy parameter(s) from their original setting in case 1a, without eliminating rent-seeking behavior. In cases 1b, 2b, 3b, 4b, EV denotes the equivalent variation of eliminating rent-seeking while leaving the subsidy parameters at the values in the corresponding a case.

71 billion rupees, or close to 10% of GNP. However, the losses are less than the total value of the rents. At first glance, this result appears to contradict the suggestion in the earlier analysis that when education is subsidized, the losses from rent-seeking may be substantially higher than the value of the rents. In the present case, however, there is also a subsidy on the use of capital services. With the elimination of rent-seeking, there is a substantial expansion in the production of manufactured goods and therefore an increase in the use of capital services. The gains from eliminating the rent-seeking are therefore partially offset by the increased subsidy payments for the use of capital services.

In subcase 2, it is assumed that the subsidy for the use of educated labour is removed. In line 2a, it is seen that there is an efficiency gain of 19 billion rupees from removing the subsidy. Part of the reason for this is that removal of the subsidy reduces the amount of rent-seeking: even though eliminating the subsidy to education raises the domestic price of the manufactured good and thus also raises the value of rents, the increase in the equilibrium return to educated labour leads to a decrease in the number of skilled workers engaged in rent-seeking. Again, the efficiency gain from the elimination of rent-seeking (line 2b) is considerably less than the value of the rents.

In subcase 3, it is assumed that both the subsidy to education and the subsidy on the use of capital services have been eliminated. As shown in line 3b, the gain from eliminating rent-seeking is now estimated at 188 billion rupees, or about 20% of GNP. With no subsidy either for the use of capital or educated labour, we now confirm the validity of Krueger's method of evaluating the welfare loss from rent-seeking: the efficiency gain in this case is virtually identical to the value of the rents themselves.

It is interesting to note that the removal of these subsidies yields an efficiency loss in the presence of rent-seeking. The intuition here is straightforward: removing the subsidies raises the domestic price of the manufactured good, which raises the value of the rents and therefore raises the efficiency loss from rent-seeking. (On the other hand, removing these subsidies induces a more efficient combination of factors of production in the manufacturing sector, so that the net loss from removing the subsidies is relatively small.) In subcase 4, finally, it is assumed that the subsidy to education is retained, but the subsidy for the use of capital services is removed. Paradoxically, removing the capital subsidy implies a large efficiency loss (line 4a). This results because the subsidy removal raises the price of the manufactured good and hence increases the value of rents and the extent of rent-seeking; the subsidy to education raises the welfare loss from the incremental rent-seeking. In line 4b, we see that without the subsidy to capital, the logic of Figure 1 is confirmed: the efficiency gain from eliminating rent-seeking is now estimated at 221 billion rupees (almost 25% of GNP), which is about 25% more than the estimated value of the rents themselves. The reason this happens is that the subsidy to education implies an indirect subsidy to the socially wasteful rent-seeking activity, reinforcing the direct efficiency loss from rent-seeking.

The results from the second set of experiments are summarized in Table 2; recall that in this set of simulations, rent-seeking does not involve a direct resource waste, but is equivalent to an implicit subsidy to education. Subcase 1a is the "base case", with the explicit subsidies to capital and education set at the same values as in the "base case" in the previous subsection;¹ the

¹The general equilibrium model was not recalibrated when we computed the second set of solutions; thus the base case 1a for this set of experiments does not correspond to observed data, but instead represents the equilibrium that would have been observed at the original set of subsidy and tariff rates if the rent-seeking equilibrium would have involved condition (16) rather than (14).

Table 2

Results of Simulation Experiments, Version 2[†]

Case	Rent*	EV**	M	P	π
1a	54	n.a.	98	367	2.32
1b		27 (4.0%)	103	383	2.72
2a	66	15	101	376	2.53
2b		27 (3.7%)	105	393	3.05
3a	125	61	108	407	3.50
3b		26 (2.7%)	111	424	4.31
4a	114	42	104	396	3.32
4b		47 (5.3%)	111	421	4.02

NOTES:

[†]Rent-seeking in this version is assumed to take the form corresponding to equilibrium condition (16): $\sigma_R = R/S = (\pi - 1.44)\bar{Q}/S$. For all subcases, simulation a denotes solution with rent-seeking, simulation b without rent-seeking.

Parameter settings:

- Case 1: $\sigma_c = 1.44$, $\sigma_s = 4.04$
 2: $\sigma_c = 1.44$, $\sigma_s = 0$
 3: $\sigma_c = 0$, $\sigma_s = 0$
 4: $\sigma_c = 0$, $\sigma_s = 4.04$.

* Billions of rupees.

** Billions of rupees; figures in parentheses are percent of GNP. For cases 2a, 3a, 4a, EV denotes the equivalent variation of changing the subsidy parameter(s) from their original setting in case 1a, without eliminating rent-seeking behavior. In cases 1b, 2b, 3b, 4b, EV denotes the equivalent variation of eliminating rent-seeking while leaving the subsidy parameters at the values in the corresponding a case.

parameter settings for cases 2-4 are the same as in the corresponding cases in the previous section.

The main conclusion to be drawn from a comparison between the simulation results in Tables 1 and 2 is that the efficiency losses that would be caused by this second type of rent-seeking would be much smaller than those associated with the type of rent-seeking postulated earlier. For example, in subcase 1 with the initial values of $\sigma_c = 1.44$ and $\sigma_s = 4.04$ for the subsidies to capital and educated labour services, a comparison between cases 1a and 1b indicates that the efficiency losses from rent-seeking would be only about 4 percent of GNP (compared with about 10 percent of GNP in the corresponding case in Table 1).¹ The largest potential loss from among the various cases (in subcase 4) is less than 5 1/2 percent of GNP, compared with 25 percent in Table 1.

Another interesting aspect of the results in Table 2 is that the interaction between rent-seeking and the subsidies for the use of capital and educated labour appear to be very different from that in Table 1. For example, with rent-seeking of the form specified in the model underlying Table 1, removal of the explicit subsidies σ_c and σ_s on the use of capital and educated labour resulted in a substantial welfare loss (subcases 3a, 4a in Table 1).

¹In interpreting this result, one must note the fact that the total amount of rent in this specification is considerably less than in subcase 1a in Table 1; this happens because the equilibrium relative price of the manufactured good is lower in case 1a in Table 2. However, it is also worth noting that the estimated efficiency loss from rent-seeking in subcase 1 is no more than about 50% of the amount of the rent. If one were to assume that the observed data for India in 1979/80 has been generated by a model incorporating rent-seeking of the second form and applies this same 50% factor, the welfare losses would have been estimated at about 6% of GNP rather than 4%.

Under the alternative form of rent-seeking underlying Table 2, there are substantial efficiency gains from removing the subsidy on capital services (subcase 4a), and from removing both kinds of subsidies (subcase 3a). This comparison illustrates that not only does the effect of rent-seeking depend on the other distortions in the economy, the efficiency effects of changing or eliminating these distortions may depend critically on the form of rent-seeking.

Summary and Conclusions

In much of the recent literature on rent-seeking in LDCs, the efficiency losses from rent-seeking have been assumed to be approximately equal to the value of the rents being sought. ("Once we take rent-seeking into account, welfare losses from quotas should include the rectangles as well as the triangles".) The main point of this paper has been to argue that this assumption may be highly misleading, for two main reasons.

First, the models in which this approximate equality holds, rely on a very special implicit assumption regarding the way the rent-bearing assets are allocated and the way an agent can engage in rent-seeking behavior to increase the probability of obtaining these assets. Specifically, the assumption is that all the rent-bearing assets are allocated to agents who seek rents by employing factors which have been withdrawn from socially productive activity and are devoted exclusively to unproductive rent-seeking. As the paper illustrates, if it is assumed instead that rent-bearing assets are allocated to agents who are engaged in particular kinds of productive activity, the predicted efficiency losses may be very different from those predicted under the conventional assumption.

Second, rent-seeking may affect activities in markets which are distorted by various kinds of taxes or subsidies. Changes in such activities will imply efficiency gains or losses which should be added or subtracted when evaluating the efficiency losses from rent-seeking. When this is done, the efficiency losses may be quite different from the value of the rents even when rent-seeking takes the form postulated in the conventional formulation.

The quantitative significance of these points has been illustrated in the context of a highly aggregative general equilibrium model with parameter values calibrated so that the initial solution replicates certain features of the Indian economy in 1979-80. Under the conventional form of rent-seeking, the efficiency losses were found to range from 10 to 25% of GNP, depending on the presence or absence of subsidy distortions in the economy; under the second type of rent-seeking referred to above, they were estimated at no more than 2.5-5.5% of GNP. To us, these results underscore the need for more empirical research on exactly where and how rent-seeking takes place in LDCs, if we are to obtain accurate estimates of its efficiency costs.

Furthermore, we have also shown that the presence and form of rent-seeking may substantially change the effects of tax or subsidy distortions on LDC economies. Thus, better information on rent-seeking might provide useful information for policymakers in charge of decisions regarding various kinds of tax and subsidy policies in LDCs. For example, the assumptions in this paper implied that rent-seeking involved a strong incentive to acquire post-secondary education. This was shown to imply much larger potential efficiency losses as a result of subsidies to post-secondary education than would have been incurred in the absence of rent-seeking.

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APPENDIX

1. Solution Procedure

We first consider the problem of solving the model when there is no rent-seeking. Assuming a solution exists, a procedure for finding it can be outlined as follows. Under competitive conditions, profits in the C and S sectors will be zero, which implies:

$$(A.1) \quad a_{cc}w_c + a_{cs}w_s + a_{cl}w_l = w_c + \sigma_c$$

$$(A.2) \quad a_{sc}w_c + a_{ss}w_s + a_{sl}w_l = w_s + \sigma_s$$

where w_c is the rental rate for capital services, w_s and w_l are the wage rates for skilled and unskilled labour respectively, and σ_c and σ_s are the direct subsidies, if any, on the production of capital and skilled labour services. Note that the a_{ij} 's, $i=c,s$, $j=c,s,l$ are constants by assumption.

The solution procedure starts with a trial value for w_l . For given values of the subsidy parameters and w_l , we can solve (A.1)-(A.2) for the factor prices w_c and w_s . From this, we can obtain the factor price ratios (w_c/w_l) and (w_s/w_l) . Given the factor price ratios, the amounts of the various inputs per unit of output in the M-sector can be found by minimizing the cost of producing a unit of M, using the production function (1). The resulting input coefficients a_{mi} , $i=c,s,l$, can be used to solve for the relative price π of the manufactured good, by using the manufacturing sector, zero-profit condition written as

$$(A.3) \quad a_{mc}w_c + a_{ms}w_s + a_{ml}w_l = \pi$$

Differentiating (2) and assuming profit-maximization in the primary-goods sector, we further have

$$(A.4) \quad (\partial P / \partial L_p) = w_\ell;$$

this condition can be used to solve for L_p , and, using (2) with \bar{H} being exogenous, for P .

The coefficients a_{ij} can also be used to solve for the total amount of unskilled labour per unit of M , taking account of both the amount used directly in the M sector as well as that used to produce the capital and skilled labour employed in the production of manufactured goods. Denoting this amount by $\hat{a}_{m\ell}$, we have

$$(A.5) \quad \hat{a}_{m\ell} = a_{m\ell} + [a_{c\ell} \ a_{s\ell}] [I - A]^{-1} \begin{bmatrix} a_{mc} \\ a_{ms} \end{bmatrix}$$

where

$$[A] = \begin{bmatrix} a_{cc} & a_{sc} \\ a_{cs} & a_{ss} \end{bmatrix}.$$

Given the value of L_p , we can solve for the value of M :

$$(A.6) \quad M = \frac{\bar{L} - L_p}{\hat{a}_{m\ell}}.$$

Finally, the value of π and the solutions for P and M can be used to solve for the amount of excess demand for the manufactured good, from (8)-(13). If the excess demand is non-zero, the initial value of w_ℓ is changed and the process is repeated. General equilibrium occurs at that value of w_ℓ and the associated relative price π at which the excess demand equals zero.

Introduction of rent-seeking using the conventional representation referred to in the text requires only a few relatively straightforward modifications to the solution procedure. Instead of (A.6), the value of M is now given by

$$(A.6') \quad M = \frac{\bar{L} - L_P - L_R}{a_{m\ell}},$$

where L_R is the number of unskilled workers used directly and indirectly to produce the services of the skilled labour S_R engaged in rent-seeking. It is straightforward to show that

$$(A.7) \quad L_R = \hat{a}_{s\ell} S_R$$

where

$$(A.8) \quad \hat{a}_{s\ell} = [a_{c\ell} a_{s\ell}] [I-A]^{-1} \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

and S_R is given implicitly by the equilibrium condition (14) in the text, which can be rewritten as:

$$(A.9) \quad S_R = R/w_s.$$

Using (A.6') it is easy to show that under plausible conditions, the excess demand function $X(\pi)$ will shift upward for $L_R > 0$, so that the equilibrium π with this form of rent-seeking will be higher than it would be without it.

When we introduce rent-seeking in the alternative form with equilibrium condition described by (16) in the text, reproduced here for convenience,

$$(A.10) \quad \sigma_R = R/S$$

the solution procedure involves letting $\sigma = \sigma_R + \sigma_s$; the model is then solved as outlined above, after substituting a given σ for σ_s in (A.2). A solution consistent with (A.10) is then found by iterating over different values of σ .

Equilibrium with this form of rent-seeking may involve a higher or lower value of π than in the absence of rent-seeking. The reason is that a subsidy on the use of educated labour has two effects in the market for M. On the one hand, it implies a subsidy for the production of M (recall that skilled labour is used only in the production of M); this should tend to decrease the excess demand for M at any given price. On the other hand, however, a subsidy on the use of skilled labour induces substitution of skilled labour for other factors in the production of M; when other factors are not subsidized, this substitution will raise the value of $\hat{a}_{m\ell}$, the total amount of labour used directly and indirectly to produce one unit of M. Inspection of (A.6) makes it evident that this implies a tendency for the excess demand function for M to shift up. The net effect of these two tendencies may be to shift the excess demand function either up or down, so that the equilibrium π may fall or rise. In the quantitative simulations reported in Table 2, the former effect was always found to dominate: the equilibrium π with rent-seeking was always lower than without it.

2. Parameter Values and Initial Conditions

Values for the various model parameters were obtained using calibration procedures similar to those described in Mansur and Whalley (1984). Initial values for the endogenous variables were obtained by assuming that the data from the Indian economy in 1979-80 shown in Table A1 represented an equilibrium solution for the model with rent-seeking of the form corresponding to equilibrium condition (14) in the paper.

The data on the value of imports at domestic prices and duty collected imply an average tariff rate of about 44%. Following Mohammad and Whalley (1983)

we assumed that these data referred to the controlled price of imported goods and that the market-clearing price was twice the controlled price. Thus the equilibrium domestic price of the manufactured good was assumed to be $1.44 \times 2 = 2.88$ and total rents R equal to Rs. 87.9 billion.

The input coefficients a_{mi} and a_{ci} , $i=l,s,c$ were computed as follows. First, we assumed that in the observed equilibrium, we had $a_{mi} = a_{ci}$, $i=l,s,c$. Disregarding intermediate inputs and with the unit price of 2.88 for the manufactured good, the number of units of the manufactured good produced in 1979-80 was set at $614,793/2.88 = 213,470$. From the data in Table A1 we could then compute $a_{ml} = a_{cl}$ and $a_{ms} = a_{cs}$. With similar input coefficients in the M and C sectors, and assuming that both sectors face the same input prices, condition (A.1) implies that $w_c + \sigma_c = 2.88$. Assuming that σ_c was 50%, we postulated $w_c = 1.44$. Table A1 then implies that the number of units of capital used in the manufacturing sector was $180,436/1.44 = 125,302$. From this we could compute $a_{mc} = a_{cc}$. Finally, we interpreted the data on the manufacturing sector in Table A1 as including the output of both our C and M-sectors. This interpretation implies $C = 125,302$ and $M = 213,470 - 125,302 = 88,168$. Together with $\bar{Q} = 60,875$, this implies $Q_m = 60,875 + 88,168 = 149,043$.

Input coefficients for the educational services sector were computed as follows. The return w_s to educated labour was computed from the data on the manufacturing sector as $96,720/7,202 = 13.43$. The rent-seeking equilibrium condition $S_R = R/w_s$ then implies $S_R = 87,900/13.43 = 6,545$. Adding this to the skilled labour in the manufacturing sector and in the educational sector itself produces $S = 6,545 + 7,202 + 1,754 = 15,501$.

This allows us to compute the coefficients a_{ss} and a_{sc} from the data in Table A1. The amount of unskilled labour engaged in the production of educational services was taken to be equal to the number of students from Table A1 (30,300,000) plus the total value of S, since part of the opportunity cost of the services of a skilled worker is the forgone output that the educated person could have produced as an unskilled worker. The value of the subsidy parameter σ_s was computed from condition (A.2); note that the value of w_ℓ can be computed directly from Table A1 as $w_\ell = 337,637/62,853 = 5.37$.

Since our model requires that the unskilled wage rate is the same in all sectors, we estimated the number of units of unskilled workers in the primary sector by dividing the total earnings of labour in that sector by w_ℓ as estimated from the manufacturing sector; one obtains $L_p = 247,570/5.37 = 46,102$. Units are chosen such that the return to one unit of land is unity, which allows us to compute the input coefficients $a_{p\ell}$ and a_{ph} in the primary sector. With the price of the primary good equal to unity, trade balance implies that $Q_p = P - \bar{Q} = 355,716 - 60,875 = 294,841$.

The functional forms of the production and utility functions are as follows: On the production side, a standard CES function (with constant returns to scale) has been used for both the manufacturing and primary sectors;

$$(A.11) \quad M = [A_s S_m^{-\delta} + A_c C_m^{-\delta} + A_\ell L_m^{-\delta}]^{-\frac{1}{\delta}}$$

$$(A.12) \quad P = [B_h H_p^{-\beta} + B_\ell L_p^{-\beta}]^{-\frac{1}{\beta}}$$

where S, C, L and H are the factors of production--skilled labour, capital, unskilled labour and land, respectively. On the demand side, we have used the following form of CES utility function:

$$(A.13) \quad U = -\frac{1}{\gamma} [FQ_m^{-\gamma} + Q_p^{-\gamma}].$$

Calibration of the model to yield a set of parameters for the production and utility functions which are consistent with the data described above is now possible if values are chosen for the parameters δ , β , and γ in (A.11)-(A.13). The parameters for the production functions were chosen by assuming that the elasticity of substitution, η , between capital and labour in manufacturing was .75, and using the relation $\eta = 1/(1 + \delta)$; for the primary sector, we assumed an elasticity of substitution of 1.1 which implies $\beta = -1/11$.¹ The parameter γ in the utility function, finally, was derived by finding the own-price elasticity of demand for the primary good using the demand function corresponding to maximization of (A.13) subject to the budget constraint (9) in the text, and setting the result equal to -.4. Using the observed budget share $Q_m/Y = .5917$, the result implies $\gamma = 5.4526$.

¹The value of .75 for the elasticity of substitution in manufacturing is the midpoint of the range 0.5-1.0 quoted by Todaro (1981) as the most frequently estimated elasticity values in manufacturing. Todaro quotes the well-known study by Morawetz (1974) as his source. The somewhat higher value for the elasticity in primary production was chosen on the basis of the widely held view that there is usually more scope for factor substitution in agriculture than in manufacturing.

TABLE A1

Manufacturing Sector:

Value added	614,793	Rs. million
Return to capital	180,436	"
Return to unskilled labour	337,637	"
Return to skilled labour	96,720	"
Number of unskilled workers	62,853	thousand man-years
Number of skilled workers	7,202	"

Primary Sector:

Value added	355,716	Rs. million
Return to unskilled labour	247,570	"
Return to land (residual)	108,146	"

Educational Sector (Secondary and Post-Secondary):

Return to capital	980	Rs. million
Number of students	30,300	thousand man-years
Number of teachers (skilled)	1,754	"

Imports:

Domestic value of imports at official prices	87,900	Rs. million
Import duty collected	27,025	"

Sources: 1. National Accounts Statistics 1970-71 to 1979-80, C.S.O., Government of India, February 1982.

2. A Technical Note on the Sixth Plan of India (1980-85), Planning Commission, Government of India, July 1981.

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